CLAIMS

What is claimed is:

1. A system for detecting acousto-photonic emissions in optically turbid media, comprising:

a sound source operative to generate an ultrasonic wave for propagation through an optically turbid medium;

a light source operative to generate a signal light beam, the signal beam being directed toward the turbid medium,

wherein the signal beam is phase modulated in the presence of the ultrasonic wave within an interaction region of the turbid medium; and

a photo-detector operative to receive the phase modulated signal beam, and to convert the phase modulated signal beam to an intensity modulated signal beam,

wherein the intensity modulated signal beam has a DC offset having an amplitude that is a function of a modulated photon density in the interaction region of the turbid medium, and

wherein the DC offset is indicative of an object or an abnormality at the interaction region of the turbid medium.

2. The system of claim 1 wherein the sound source includes an acoustic transducer.

3. The system of claim 2 wherein the acoustic transducer comprises a piezoelectric transducer.

4. The system of claim 1 wherein the light source includes a laser.

5. The system of claim 4 wherein the laser is operative to generate a coherent beam of light.

6. The system of claim 1 wherein the photo-detector includes a photo-refractive crystal operative to receive the phase modulated signal beam.

7. The system of claim 6 wherein the light source is operative to generate a first light beam, further including a beam splitter operative to split the first light beam to produce the signal beam and a reference beam, and wherein the photo-refractive crystal is operative to receive the phase modulated signal beam and the reference beam, to convert the phase modulation of the signal beam to intensity modulation by interference of the signal beam and the reference beam within the crystal, and to provide the intensity modulated signal beam.

8. The system of claim 7 wherein the photo-detector further includes a photo-diode operative to receive the intensity modulated signal beam.

9. The system of claim 7 further including an AC field source operative to provide an AC field to the photo-refractive crystal.

10. The system of claim 1 wherein the turbid medium comprises biological tissue.

11. A method of detecting acousto-photonic emissions in optically turbid media, comprising the steps of:

generating an ultrasonic wave for propagation through an optically turbid medium;

generating a signal light beam;

directing the signal beam toward the turbid medium,

wherein the signal beam is phase modulated in the presence of the ultrasonic wave within an interaction region of the turbid medium; and

converting the phase modulated signal beam to an intensity modulated signal beam,

wherein the intensity modulated signal beam has a DC offset having an amplitude that is a function of a modulated photon density in the interaction region of the turbid medium, and

wherein the DC offset is indicative of an object or an abnormality at the interaction region of the turbid medium.

12. The method of claim 11 wherein the sound source includes an acoustic transducer.

13. The method of claim 12 wherein the acoustic transducer comprises a piezoelectric transducer.

14. The method of claim 11 wherein the light source includes a laser.

15. The method of claim 14 further including the step of generating a coherent beam of light by the laser.

16. The method of claim 11 further including the steps of generating a first light beam by the light source, splitting the first light beam to produce the signal beam and a reference beam, providing the phase modulated signal beam and the reference beam to a photo-refractive crystal, and wherein the converting step includes converting the phase modulation of the signal beam to intensity modulation by interference of the signal beam and the reference beam within the crystal.

17. The method of claim 16 further including the step of providing an AC field to the photo-refractive crystal.

18. The method of claim 11 wherein the turbid medium comprises biological tissue.